

US-PAT-NO: 5142592

DOCUMENT-IDENTIFIER: US 5142592 A

TITLE: Method and apparatus for
detection of parallel edges in
image processing

DATE-ISSUED: August 25, 1992

INVENTOR-INFORMATION:

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US-CL-CURRENT: 382/200, 382/203

ABSTRACT:

A method and apparatus for detection of parallel edges in image processing systems is shown. A video source producing an image which is operated upon by Laplacian of Gaussian operator to produce an LOG image within which sign changes are detected to produce a zero crossing edge detected image. A vector gradient field of the LOG image is computed and subjected to a gradient field smoothing operation to produce a smoothed gradient field. The smoothed gradient field is examined to detect scalar minima within the field and the results thereof used to compute parallelism strength in accordance with preestablished criteria to generate a parallelism line image which is printed

using a conventional printer.

12 Claims, 25 Drawing figures

Exemplary Claim Number: 1

Number of Drawing Sheets: 7

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Detailed Description Text - DETX (5):

This convolution relates in a smoothed gradient vector field which is coupled to minima detection means 23. It has been found that two closely spaced edges of opposite orientation in the gradient field will produce a minimum magnitude in the smoothed gradient vector field at a point halfway between the edges. Thus, it has been found that detection of a minima in a smoothed gradient field produce a series of points representing the desired parallelism line. Accordingly, minima in the magnitude component of smoothed gradient vector field correspond to points of parallelism, near symmetry in the edge image. Thus, minima detector 23 is operative solely upon the magnitude component of the smoothed gradient vector field. It has been found that two possible approaches are evident for the detection of magnitude minima. The first is referred to as directionally independent minima while the second is referred to as directionally dependent minima. Directionally independent minima arise in situations in which a signal point

of minimum value is found and, as a result, movement in any direction therefrom produces an increased magnitude. In contrast, directionally dependent minima corresponds to a line or plane in which the minimum magnitude exists at a plurality of points in one or more directions while an increase in magnitude results in certain directions only. Directionally dependant minima approximately correspond to the axis of symmetry of an object.

Detailed Description Text - DETX (15):

While the values associated with each of the above quantities may be explicitly and accurately computed at each parallelism pixel, such an approach has not been found to be practical. A more practical approach has been found which uses two measures of parallelism strength which relates indirectly to the above quantities. The first measure which can be computed is the magnitude of the smoothed gradient vector field at each point on the parallelism line. In this computation, equal strength (contrast) edges one hundred eighty degrees apart in orientation will produce a near zero value smoothed gradient magnitude. In contrast, edges of different edge strength or orientation produce a greater smoothed gradient magnitude. Thus, a small smoothed gradient magnitude is an approximate indicator of a high degree of parallelism and similarity of edge strength.